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# PATENT SPECIFICATION



Convention Date (Germany): March 2, 1929.

344,210

Application Date (in United Kingdom): Feb. 27, 1930. No. 6516/30.

Complete Accepted: March 5, 1931.

## COMPLETE SPECIFICATION.

### Improvements in Filters for Vacuum Cleaners.

We, ELECTROLUX LIMITED, of 153 & 155, Regent Street, London, W. 1, a British Company (Assignees of INVENTIA PATENT-VERWERTUNGS-GESELLSCHAFT, of Herrenacker 10, Schaffhausen, Switzerland, a body corporate organised under the laws of Switzerland) do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a filter for vacuum cleaners.

Searching bacteriological tests have shown that a filter, consisting of two or more spaced filtering layers formed of a suitable filter material, such as fabric, is completely or substantially completely impenetrable for bacteria which may be contained in the air circulated by the vacuum cleaner. It is, however, necessary that the abovementioned filter layers do not contact with one another, otherwise, on account of vibrations set up by the motor and the air current, the bacteria will, so to speak, be rubbed through the filtering layers.

According to the present invention in a vacuum cleaner a filter adapted to be located behind a dust removing bag or like filter comprises a frame member and at least two fabric filter layers mounted on said frame and arranged immediately adjacent to but maintained out of contact with one another.

Further by this invention spaced fabric filter layers mounted on a frame are adapted to form a packing between the frame and an apparatus casing enclosing the same.

The fabric filter layers may be separated by wadding located between the layers and provided with means to hold the wadding in its spacing position.

The filter is preferably constructed so as to be exchangeable and arranged between the driving motor of the cleaner and an exhaust opening in a casing surrounding the same.

A further feature of the invention resides in the provision of a rigid air-pervious wall located behind each filter layer against which the filter layer dur-

ing operation can lie flat. Further, in the filter of the invention, each filter layer is maintained taut.

The invention will be hereinafter described with reference to the examples shown in the accompanying drawings, wherein:—

Figure 1 shows a vacuum cleaner in longitudinal section, fitted with a filter according to the invention,

Figures 2 and 3 show a modified construction of the filter,

Figure 4 shows a vacuum cleaner partly in section having a divided casing between which the filter layers are engaged,

Figures 5 and 5a show a further embodiment of the filter,

Figures 6 to 10 show two different embodiments of filter according to the invention removable through a lateral closeable opening provided in the vacuum cleaner casing.

Referring to Figure 1, 10 indicates the casing of the vacuum cleaner which, as is usual in cleaners of this type, encloses a dust bag, a fan 12, and a driving motor 13 for the latter. An intermediate wall 14 divides the casing into suction and pressure chambers.

End caps 15 and 16 are mounted on the ends of the casing 10, of which cap 15 is formed with the suction opening 17 and cap 16 the pressure or blowing opening 18. The apparatus is further provided with sledge runners 19 on which it can be moved during operation, and, moreover, a carrying handle 20.

A filter constructed in accordance with the invention is exchangeably arranged within end cap 16. In this embodiment the filter comprises two layers 21 and 22 consisting for example of flannel, which are stretched over a circular frame 24 having a flange 23. The flange 23 is provided with a groove 25 in which the outer edges of the preferably circular filter cloths 21 and 22 are maintained by wire or binding threads 26. Tongues 28 are stamped out of the front wall 27 of the frame 24 and bent out at right angles, the said wall thus being apertured and the tongues serving as holding means for

wadding 29 or the like, which is inserted between the wall 27 and the rear filter layer 21. This is necessary as otherwise the wadding, after being in use for a short time, would become packed together in the lower part of the filter.

In end cap 16 an abutment flange 30 is provided, against which lies a wire gauze 31. The wire gauze may, if desired, be soldered fast to the flange 30. The whole filter is pushed against the gauze 31 so that the filter cloth 21 lies flat against the same. The frame 24 and flange 23 thereof, are so dimensioned relatively to the inner diameter of cap 16 that the filter cloths 21 and 22 automatically form a packing against the inner wall of the cap. After the filter has been in operation a certain time, it may be taken out after removal of cap 16, which is connected with the casing 10 by toggle lever clamps or the like. The filter cloths 21 and 22 and the wadding 29 will be taken off the frame and burnt, or otherwise destroyed, whereupon new wadding and new filter cloths will be arranged on the frame, and the whole filter again inserted in cap 16.

Those parts of the embodiments illustrated in Figures 2 to 10 which agree with those of Figure 1 are indicated by the same numerals.

In the construction illustrated in Figures 2 and 3, the filter again comprises two filter cloths 21 and 22, which are stretched around a spring 32 formed in the manner of a watch spring, and are sewn together at the front side (reckoned in the direction of flow of the air). The purpose of spring 32, which is constructed as a relatively broad spring steel band, is partly to hold the filter layers 21 and 22 at a fixed distance from one another in accordance with the invention, and partly in case wadding is provided between said filter cloths, to prevent the wadding packing together. Further, one of the filter cloths, in the embodiment illustrated the cloth 22, is pressed by the spring 32 against the inner wall of the cap 16, thereby producing a packing between the filter and the cap. The packing effect will be still further increased on the filter being pressed by the air stream against the cone-shaped surface 33 of cap 16.

In the embodiment illustrated in Figure 4, the cap 16 is constructed of three parts *a*, *b*, and *c*, the parts *b* and *c* being enlarged at their front ends as shown at 34 and 35, and against the bottom of the enlargements lie wire gauzes 31. At the rear ends of the parts *a* and *b* reinforcing rings 36 and 37 are mounted, against which abut the filter cloths 22 and 21 respectively. The enlargements 34 and

35 are internally threaded and are screwed on the parts *a* and *b* respectively, which are provided with corresponding external threads, so that the filter cloths 21 and 22 are clamped fast between rings 36 and 37 and the wire gauzes 31. In this embodiment also wadding 29 may be provided between the filter cloths.

The filter illustrated in Figures 5 and 5a provides a slotted and thereby resilient ring 38 which is formed peripherally with two grooves 39. The filter cloths 21 and 22 are secured to the ring 38 by circular bands 40 of steel wire or the like. After the cloths 21 and 22 have been applied the bands 40 will be forced over the outmost periphery of the ring 38 which then springs together and the bands snap into the grooves 39, as can be seen from the drawings. The filter cloths will be secured by the resilient action of the ring 38 and with this type of fastening will also be stretched very taut. The casing 10 has at its right end an abutment flange 41, against which the filter is pressed by the cap 16. The packing in this embodiment, therefore, does not lie at the periphery of the filter, but between rings 38 and flange 41.

Figures 6 to 10 show a new arrangement for exchanging a filter according to the invention, and also two further embodiments of the filter itself.

End cap 16 in Figures 6 and 7 is constructed on its under side with a slot-like opening 42 which extends through about 120° of the periphery and is closable by a cover 43. The cover 43 is rotatably secured on the cap by a hinge 44, and is locked by means of a snap catch 45. In order to pack the cover 43 against cap 16 the cover is fitted with a packing 46 of rubber or the like. The filter itself consists of a ring 47 around which the filter cloths 21 and 22 are stretched and sewn. In cap 16 is arranged an abutment flange 48. The ring 47 is preferably formed resilient in order that it can be compressed when being inserted through the opening 42.

The constructions shown in Figures 8 to 10 differ from the last mentioned in that the casing opening 42 here extends over half the periphery of the cap 16. By this construction it is unnecessary to form the ring 47 resilient, but it may be formed rigid. In order to allow the cover 43, when removed from the opening 42, to become free of the runners 19, the cover is constructed of easily bendable spring steel plate. The ring 47 in this embodiment also is formed at its periphery with a groove 49 in which the outer edges of the filter cloths 21 and 22 are held fast by binding threads or the like. The cap

16 is formed with two flanges 48 between which the filter on insertion and during use is guided. Further, a packing band 50 of U shaped cross-section is arranged at the periphery of the filter and is so dimensioned as to serve as packing between the filter and the cap 16 or the flanges 48 thereof.

In these two last mentioned embodiments it is not necessary to construct the cap 16 so as to be easily removable from the casing 10 in the previously described manner. The cap 16 may be screwed on a reinforcing ring 51 provided at the end of the casing, as the same need only be removed when repairing the motor or the like.

In the various embodiments described and shown the filters are provided with only two filtering layers, but it is obvious that any suitable number of layers can be used. Moreover the filter may, in order to facilitate exchange of the same, be fitted with a suitable handle.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

(1) A filter for vacuum cleaners adapted to be located behind a dust removing bag or like filter or filters which comprises a frame member and at least two fabric filter layers mounted on said frame member and arranged immediately adjacent to but maintained out of contact with one another.

(2) In a vacuum cleaner having a dust removing filter or filters the provision of a further filter which comprises a frame member and two spaced fabric filter layers mounted immediately adjacent one another on said frame and arranged so as to form a packing between the frame and the apparatus casing enclosing said frame.

(3) In a vacuum cleaner having a dust removing filter or filters the provision of a further filter comprising two fabric filter layers, wadding located between the layers to form a spacing means therefor and means to retain the wadding in its spacing position.

(4) A filter according to claim 1, 2, or 3, constructed and arranged so as to be easily exchangeable.

(5) A filter for vacuum cleaners according to claims 1, 2, or 3, and having the motor arranged within an external casing in which the filter is arranged between the said motor and the exhaust opening in the casing of the apparatus.

(6) A filter according to any of the pre-

ceding claims arranged in a removable end cap of the cleaner.

(7) A filter according to claim 1 or 3 in which a packing is provided between the outer edge of the filter and the inner wall of a casing of the apparatus so that the entire air circulated by the apparatus fan flows through the filter.

(8) A filter according to claim 1 or 2 in which the fabric layers are held in spaced relation by means of wadding or the like.

(9) A filter according to claim 1 or 2 in which the fabric layers are held in spaced relation by means of a spring.

(10) A filter according to claim 9 in which the spring is formed in the manner of a watch spring.

(11) A filter according to claim 3 or 8 in which the wadding is held in position by tongue shaped members mounted on a perforated wall arranged behind the first filter layer.

(12) A filter according to claim 1 or 2 in which the filter layers are held apart from one another by means of rings.

(13) A filter according to claim 12 in which the rings are constructed so as to be resilient.

(14) A filter according to any of the preceding claims in which a rigid air permeable wall is arranged behind each filter layer against which the layer is adapted to lie.

(15) In a vacuum cleaner fitted with a filter constructed in accordance with any of the preceding claims the provision of a slot opening in the casing of the cleaner through which the filter can be removed or inserted.

(16) A vacuum cleaner according to claim 15 in which the slot opening of the casing is adapted to be closed by means of an air-tight cover during operation of the cleaner.

(17) A vacuum cleaner according to claim 16 in which the cover is formed of resilient material.

(18) Filters for vacuum cleaners constructed and arranged substantially as described with reference to the accompanying drawings.

(19) A vacuum cleaner provided with a filter constructed and arranged substantially as described with reference to the accompanying drawings.

Dated the 27th day of February, 1930.

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FIG. 1.

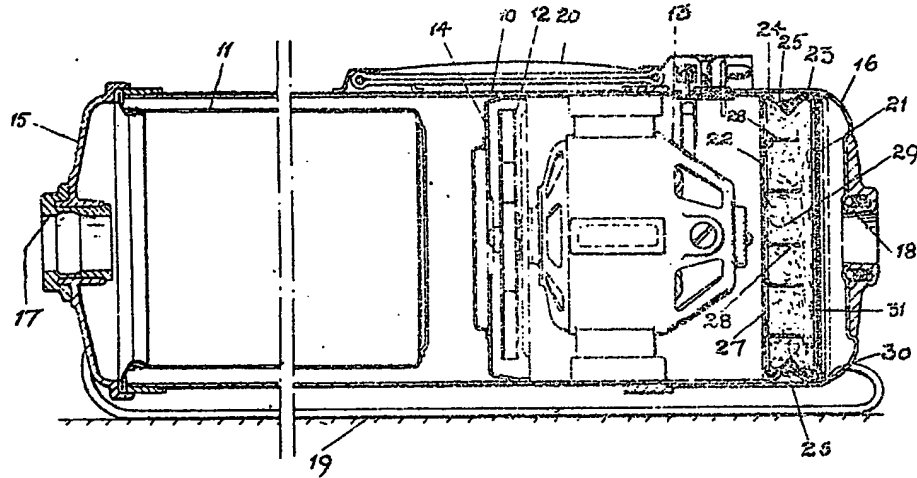


FIG. 2.

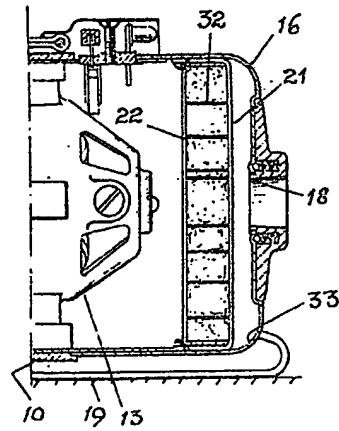
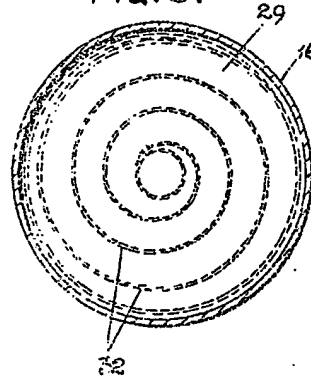


FIG. 3.



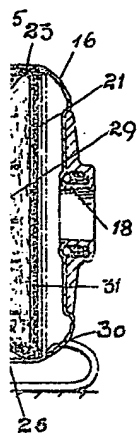


FIG. 4.

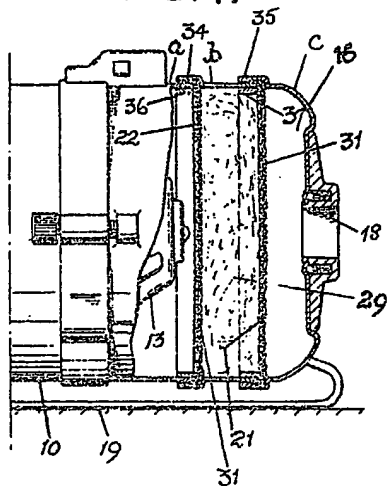


FIG. 5.

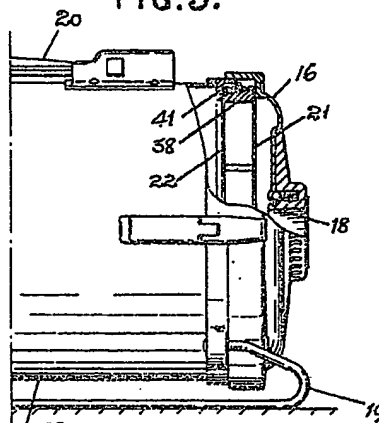


FIG. 5a.



FIG. 6.

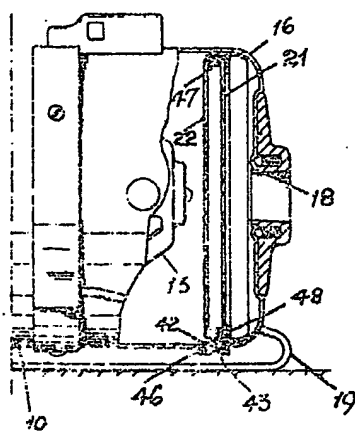
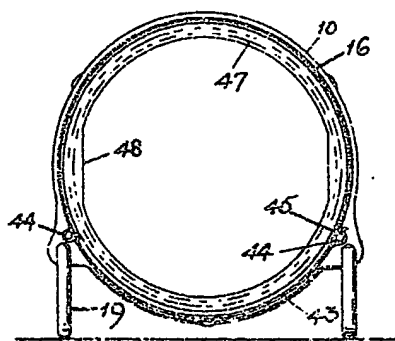


FIG. 7.



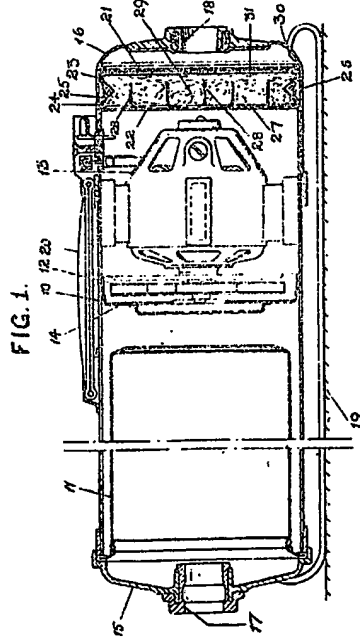


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

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